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ABSTRACT

Four studies were conducted to examine the manner in which cognitively impulsive and reflective children use private speech to control their behaviors. The first study was a naturalistic observation of a group of impulsive (N=8) and reflective (N=8) nursery school children, identified by the Matching Familiar Figures Test. The Impulsive and reflective children differed significantly in the amount and style of verbalizations and in the content and incidence of private or egocentric speech. In a second study the relationship between reflectivity/impulsivity and verbal control of motor behavior was examined with 30 kindergarten children. Under covert self-instructions, impulsive children evidenced significantly less verbal control of inhibitory motor behavior and a greater magnitude of errors than reflective children. The efficacy of a cognitive self-instructional (SI) training procedure in altering the behavior of "impulsive" school children was examined in two studies. Study III employed an individual training procedure requiring the impulsive child to talk to himself. Results indicated that the SI group (N=5) improved significantly on three measures and retained the improvement after one month. Study IV examined the efficacy of the components of the cognitive treatment procedure in altering the impulsive child's performance on Kagan's measure of cognitive impulsivity. Cognitive modeling slowed down the response time for initial selection, but only with the addition of self-instructional training was there a significant decrease in errors. (Author/KM)

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The Nature and Modification of Impulsive Children: Training Impulsive Children to Talk to Themselves

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ABSTRACT

Four studies were conducted to examine the manner in which cognitively impulsive and reflective children use private speech to control their behaviors. The first study was a naturalistic observation study of a group of impulsive (N=8) and reflective (N=8) nursery school children as identified by the Matching F miliar Figures Test, a measure of cognitive impulsivity. The childrens' private speech, verbalizations, and social behaviors were recorded for three weeks by trained observers. The impulsive and reflective children did not significantly differ in the amount and type of social participation (i.e., according to Parten and Newhall's (1943) classifications), but did differ significantly in the amount and style of verbalizations and in the content and incidence of their private or egocentric speech (i.e., according to the private speech categories of Kohlberg, Yaeger, and Hjertholm, 1968). In a second study the relationship between the cognitive dimension of reflectivity-impulsivity and verbal control of motor behavior was examined with 30 kindergarten children. Under covert self-instructions impulsive children, on a Luria-type verbal control task, evidenced significantly less verbal control of inhibitory motor behavior and a greater magnitude of errors than reflective children. The results of the observational study and the second correlation study suggested that impulsive children manifest less

verbal control over their motor behaviors and use private speech in a less instrumental fashion than reflective children. These results suggested that training impulsive children to talk to themselves in a directive regulatory fashion would facilitate behavior change and engender self-control.

The efficacy of a cognitive self-instructional (SI) training procedure in altering the behavior of "impulsive" school children was examined in two studies. Study III employed an individual training procedure which required the impulsive child to talk to himself, initially overtly then covertly, in an attempt to increase self-control. The results indicated that the SI group ($\underline{N}$=5) improved significantly on Porteus Maze test, performance IQ on the WISC, and on a measure of cognitive impulsivity relative to attentional and assessment control groups. The improved performance was evident in a one month followup assessment. Study IV examined the efficacy of the components of the cognitive treatment procedure in altering the impulsive child's performance on Kagan's (1966) measure of cognitive impulsivity. The results indicated that cognitive modeling alone was sufficient to slow down the impulsive child's response time for initial selection, but only with the addition of self-instructional training was there a significant decrease in errors. The treatment and research implications of modifying $\underline{S}$s' cognitions were discussed.

This report is based on a paper presented at the Society for Research in Child Development Conference, April, 1971, Minneapolis, Minnesota.

THE NATURE AND MODIFICATION OF IMPULSIVE CHILDREN: TRAINING IMPULSIVE CHILDREN TO TALK TO THEMSELVES[1]

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Four studies were conducted to examine the manner in which cognitively impulsive and reflective children use private speech to control their behaviors. The reflectivity-impulsivity dimension describes a consistent developmental tendency for a child to display slow or fast decision times in problem situations where he must select one hypothesis from several possibilities. In other words, the dimension indicates the degree to which the child reflects on the validity of his solutions and pauses to evaluate the quality of his cognitive products. The instrument used to identify cognitively reflective and impulsive children is Kagan's (1966) Matching Familiar Figures Test (MFF) which requires the child to select from an array of variants one picture which is identical to a standard picture. Impulsive and reflective children are identified on the basis of a S's response time to his first decision and total number of errors. Impulsive children make many errors and have very fast decision time; whereas reflectives make few errors and have slow deliberate decision times. The present studies examined the interrelationships of a child's private speech, his cognitive style, and his behavior.

The first naturalistic observation study was designed to determine if impulsive children in comparison to reflective nursery school children, differ in the quantity and content of their private speech. Eight impulsive and eight reflective four and one-half year old nursery

school children were selected for observation from a group of twenty-four nursery school children on the basis of their performance on the Matching Familiar Figures Test[2] (MFF). Table 1 presents the mean performance of the reflective and impulsive groups on the MFF test and on such matching variables as Peabody IQ and chronological age. The two groups were significantly different only on the MFF test with the impulsives making twice as many errors and using half as much decision time as the reflectives. The sixteen children were observed by two trained raters for three weeks in a community nursery school in which one-fourth of the children were from middle class college educated parents and the remaining three-fourths were from working class parents.

The raters used a time sampling observational procedure, whereby they observed a given child for a five minute period. The five minute period was broken down into intervals of ten seconds of observation, ten seconds of recording, yielding fifteen observations within a five minute period. Following a week of familiarization and reliability training (i.e., the lowest percent agreement being 75% and lowest reliability coefficient being .78), observations were collected over a two week period. The observations included the classification of the child's social participation or play behavior into one of six categories as described by Parten and Newhall (1943). The six categories included unoccupied behavior, solitary play, onlooker behavior, parallel play, associative play, and cooperative play. An overall social participation or social maturity score was obtained by combining the six categories of behavior in a weighted percentage score[3]. Table 2 indicates that the impulsive and reflective nursery school children do not significantly differ in their

play behavior and that they expend a similar amount of time in the various types of peer interactions. Accumatively, across the six behavioral categories there is a trend ($p < .10$) for the reflective children to be slightly more mature than the impulsive children as indicated by a higher social participation score.

The second major category of behavior observed was the childrens' incidence of their verbalizations and the content of their private or egocentric speech. The reflective children were found to verbalize on 56% of the time sample intervals in which they were observed compared to only 38% for the impulsive children -- a difference which is significant at the .01 level ($t = 2.66$, $df = 16$). Figure 1 indicates the percentage of vervalizations which fell into each subcategory. The first category was egocentric or private speech which was defined as verbalizations which are not addressed or adapted to a listener, (Kohlberg, Yaeger, and Hjertholm, 1968). The impulsive children had twice as much egocentric speech as the reflectives, 24% vs 12%, ($t = 2.01$, $p < .05$). An examination of the remaining subcategories of verbalizations indicated that (a) the reflectives sought information in the form of questions or gave explicit instructions more often than did the impulsives, 22% vs 14%; (b) the two groups had identical percentages of general communicative speech, 54%; (c) in terms of inaudible mutterings emitted by the child while preoccupied in a solitary manner on a given task, the reflectives evidenced three times as many mutterings as the impulsives, 8% vs 2.5% ($t = 2.72$, $p < .01$). Kohlberg et. al. (1968) have viewed such inaudible mutterings as external manifestations of inner speech. The raters recorded an equal amount of indecipherable speech of 5% for both groups on the final category of unclassifiable speech which occurred between children. These percentage

differences in the subcategories of verbalizations are quite significant, especially in light of the finding that the peer group participation scores were almost identical for the impulsive and reflective groups. Thus, the two groups spent their nursery school time in the same manner, but the quality of their verbalizations was significantly different. Such differences are further elucidated when one does a more sensitive analysis of the content of egocentric or private speech.

Kohlberg et. al. (1968) has indicated that various types of private speech can be placed on a developmental hierarchy. The lowest level being self-stimulating private speech, then outer-directed private speech, then inner-directed or regulatory private speech, and finally inaudible mutterings. Kohlberg et. al. found that lower forms of private speech, such as self-stimulation, have an earlier age curve of development and decline, than higher forms of private speech; and that the proposed developmental order is not only an order of group age trends, but is an order found for each individual. The present observational data indicates the percentage of private speech at each of four developmental levels for cognitively impulsive and reflective nursery school children. The first level of egocentric speech is self-stimulating private speech and includes such verbalizations as word play, animal noises, repeating words, and singing. Developmental level II is characterized by outer-directed private speech and includes remarks addressed to nonhuman objects and descriptions of the child's own activity. Level II is similar to Piaget's (1966) category of collective monologue. Level III represents inward directed or self-guiding private speech, including self-instructions. Finally, level IV represents external manifestations of inner speech in the form of inaudible mutterings which are uttered in such a low voice that they are indecipherable to an auditor close by.

Several investigators (Klein, 1963; McCarthy, 1930; Piaget, 1926; Kohlberg et. al. 1968) have found that the child's egocentric speech is influenced by situational determinants. Thus two general activities in the nursery school setting were identified and the children's private speech was recorded in each (see Figure 2 and Table 3). The two general activities were free play and specific tasks. The specific tasks involved uninterrupted activities in which the child worked alone, although he was in the presence of other children, on such tasks as painting, pegs, stringing beads, puzzles. Free play represented the variety of interactive activities in which children engage while in a permissive nursery school. Figure 2 indicates that the impulsive children's private speech was made up of 64% of the most immature self-stimulatory content and more significantly, the incidence of self-stimulatory private speech did not decrease in specific task situations. In comparison, the reflectives manifested significantly more outer-directed and self-regulatory private speech and significantly more inaudible mutterings. Moreover, the private speech of reflective children was significantly more responsive to situational demands of specific tasks as indicated by an increase from 11% to 25% for self-guiding speech in a specific task. The results of this first observational study indicated that reflective preschoolers used their private speech in a more mature, more instrumental self-guiding fashion than impulsive preschoolers.

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A second study (Meichenbaum & Goodman, 1969) was conducted in order to further examine the relationship between the cognitive dimension of reflectivity-impulsivity and the degree of the child's own verbal control over his motor behavior as indicated on a Luria type task. A within subject design was used in which kindergarten children were asked

to depress a foot pedal to a prearranged sequence of 24 lights (12 blue, 12 yellow) under a covert and overt self-instructional condition. For the covert condition the S was instructed: "When the blue light comes on push your foot down until the light goes off. When the yellow light goes on, don't push your foot down". Following a rest period and retesting as to the meaning of the lights, the task was readministered under an overt self-instructional condition. The instructions were: "When the blue light goes on, I want you to do two things. Say the word "push" aloud and push your foot down until the light goes off. When the yellow light goes on say "don't push" aloud and don't push your foot down". Thus, for each kindergarten child the verbal control of the words "push" and "don't push" on the foot depression task under covert and then overt self-instructional conditions was assessed. Two weeks later Kagan's MFF test was administered to all Ss, yielding 12 impulsive and 12 reflective kindergarten children.

The degree of verbal control of the words "push" and "don't push" on motor behavior was indicated by the percentage of accurate responses on the foot depression task. Combining both overt and covert conditions, only 40 percent of the impulsive children, whereas 85% of the reflective children met the criterion of 90 percent correct responding, indicating a significant relationship between verbal control of behavior on a Luria-type task and conceptual tempo. Figure 3 compares the mean total number of foot depressions to the "don't push" light for impulsives and reflectives under overt and covert self-instructional conditions. Figure 3 indicates an interaction effect, whereby only under the covert condition of self-instruction did the impulsive children manifest significantly less verbal control of inhibiting motor behavior than the

reflective children. A secondary finding was that the cognitively impulsive child, on a separate finger tapping task, was more likely to use self-instructions such as "faster" and "slower" in a motor or metrenome fashion, tapping each time he uttered the self-goad, suggesting a greater reliance on the motor component of private speech. In comparison, the reflective child used the verbal self-goads of "faster" and "slower" as a cue, tapping several times for each self-instruction, indicating a greater reliance on the semantic content of his self-instructions. In a recent study Bates and Katz (1970) have also found that reflective nursery school children who take more time on the MFF and made fewer errors were better able to regulate their motor behavior verbally on a Luria task than Ss who responded impulsively on the MFF. They found a correlation of .63 ($df = 18$, $p < .01$) between number of correct Luria items and MFF latencies and a correlation of -.83 ($df = 18$, $p < .01$) between correct Luria items and MFF errors.

The results of the observational study and the correlation studies suggest that impulsive children manifested less verbal control over their motor behaviors and used their private speech in a less instrumental fashion than reflective children. These results suggest that training impulsive children to talk to themselves in a directive regulatory self-guiding fashion would facilitate behavior change and engender self-control (Meichenbaum and Goodman, in press).

A cognitive self-instructional training procedure was used to train impulsive children to talk to themselves. In the first modification study, a group of 15 eight year old children (8 females, 7 males) who had been placed in an "opportunity remedial class" in a public elementary school because of poor self-control and hyperactivity, were placed in one of three

groups following a preassessment. The three groups included the cognitive self-guidance group, an attentional control group, and an assessment control group.

Cognitive Self-instructional Group. The five Ss in the cognitive training group were seen individually for four half-hour treatment sessions over a two week period. The treatment was designed to train impulsive children to talk to themselves, initially overtly then covertly, following what Vygotsky and Luria refer to as the "interiorization of language". The self-instructional training procedure was as follows: First, E performed a task talking aloud while S observed (E acted as a model); then S performed the same task while E instructed S aloud; then S was asked to perform the task again while instructing himself aloud; then S performed the task while whispering to himself (lip movements); and finally S performed the task covertly (without lip movements). The verbalizations which E modeled and S subsequently used included (a) questions about the nature and demands of the task; (b) answers to these questions in the form of cognitive rehearsal and planning; (c) self-instructions in the form of self-guidance while performing the task; (d) ways of coping with errors and failure; and (e) self-reinforcement. The following is an example of E's modeled verbalizations which S subsequently used (initially overtly, then covertly):

> "Okay, what is it I have to do? You want me to copy the picture with the diff[illegible]nt lines. I have to go slow and be careful. Ok[illegible], draw the line down, down, good; then to the right, that's it; now down some more and to the left. Good, I'm doing fine so far. Remember, go slow. Now back up again. No, I was supposed to go down. That's okay. Just erase the line carefully..... Good. Even if I make an error I can go on slowly and carefully. Okay, I have to go down now. Finished. I did it".

Note in this example an error in performance was included and E appropriately accommodated. In prior research with "impulsive" children, Meichenbaum & Goodman (1969) observed a marked deterioration in their performance following errors. E's verbalizations varied with the demands of each task, but the general treatment format remained the same throughout. The treatment sequence was also individually adapted to the capabilities of the S and the difficulties of the task.

A variety of tasks were employed to train the child to use self-instructions to control his nonverbal behavior. The tasks varied along a dimension from simple sensorimotor abilities to more complex problem solving abilities. The sensorimotor tasks, such as copying line patterns and coloring figures within certain boundaries, provided S with an opportunity to produce a narrative description of his behavior, both preceding and accompanying his performance. Over the course of a training session the child's overt self-statements on a particular task were faded to the covert level. The difficulty level of the training tasks was increased over the four training sessions requiring more cognitively demanding activities. Such tasks as reproducing designs and following sequential instructions taken from the Stanford-Binet intelligence test, completing pictorial series as on the Primary Mental Abilities test, and solving conceptual tasks on the Ravens Matrices test, required the S to verbalize the demands of the task and problem solving strategies. The E modeled appropriate self-verbalizations for each of these tasks and then had the child follow the fading procedure. Although the present tasks assess many of the same cognitive abilities required by our dependent measures, there are significant differences between the training tasks and the performance and behavioral indices used to

assess improvement.

One can imagine a similar training sequence in the learning of a new motor skill such as driving a car. Initially, the driver actively goes through a mental checklist, sometimes aloud, which includes verbal rehearsal, self-guidance, and sometimes appropriate self-reinforcement, especially when driving a stick-shift car. Only with repetition does the sequence become automatic and the cognitions become short-circuited. If this observation has any merit, then a training procedure which makes these steps explicit should facilitate the development of self-control.

In summary, the goals of the training procedure were to develop a cognitive style or learning set for the impulsive child in which he could "size up" the demands of a task, cognitively rehearse, and then guide his performance by means of self-instructions, and then appropriately reinforce himself.

Control Groups. Two additional control groups were included in order to assess the relative efficacy of the cognitive self-guidance training procedure. An attention control group of five impulsive children met with the experimenter as regularly as the cognitively trained Ss. The Ss in this attentional control group were exposed to identical materials, engaged in the same general activities, received the same number of trials on a task, and equal amounts of social reinforcement as the cognitively trained Ss. The attentional control group did not receive cognitive modeling or self-instructional training. This attention control group afforded an index of behavioral change due to factors of attention, exposure to training materials, and any demand characteristics inherent in our measures of improvement. Finally an assessment control group who received no treatment and only the pre- and post-treatment and followup assessments was included.

Results

Figure 4 indicates the mean change scores from pre-treatment to post-treatment on the psychometric performance measures. The results indicate an overall significant change for the Ss who had been exposed to cognitive training yielding an increase of 8.3 prorated performance IQ points (from 88.4 to 96.7) based on the WISC subtests; a significant increase of 27.4 seconds latency time on the MFF post-test; a significant trend of less errors on the MFF test; and significantly fewer errors on the Porteus Maze test. All Ss were assessed at a one month followup and the relative superiority of the cognitively trained Ss was maintained. The analyses of the followup test performance indicated that on the WISC prorated IQ score, the picture arrangement subtest, and the decision time score on the MFF, the cognitively trained group was significantly different from the two control groups. However, an attempt to assess the generality of the training procedures to the classroom immediately following treatment failed to yield any significant differences between groups. The absence of such a significant treatment effect in the classroom may be due to lack of generalization because of the limited number of training sessions and/or the lack of sensitivity of the classroom assessment measures.

The results of the first modification study proved most encouraging and suggested that a cognitive self-guidance training program can significantly alter behavior of impulsive children. The purpose of the next study was to examine the differential contribution of the various components of the treatment program in modifying impulsive behavior. The cognitive training procedure involved both modeling by E and subsequent self-instructional training by S. In this study a comparison is made

between the relative efficacy of modeling alone versus modling plus self-instructional training in modifying cognitive impulsivity as measured by the Matching Familiar Figures Test.

Fifteen "impulsive" children were selected from a larger group of thirty kindergarten and thirty first grade public school children on the basis of two behavioral criteria which were initial cognitive impulsivity (many errors, quick decision time) on a six item form of the MFF and the failure to significantly alter their style of responding on another six item form of the MFF even though they were explicitly instructed "not to hurry and to go slowly and carefully". Following this initial session of selection, the 15 most "impulsive" Ss were randomly assigned to one of the treatment groups (i.e., modeling alone or modeling plus self-instructional training) or to an attentional control group. In a second session one week later, the impulsive Ss were seen by a different female E who conducted the treatment, after which Ss were tested on a third form of the six item MFF test by the first male E who had conducted the testing in session 1. The training procedure which lasted some 20 minutes consisted of E performing or modeling behavior on one item of the picture matching task of the Primary Mental Abilities test and items from the Raven's Matrices test and then S doing an item. There were in all 8 practive trials.

Cognitive Modeling Group. The Ss in this group (N=5) initially observed the E who modeled a set of verbalizations and behaviors which characterized the reflective child's proposed strategy on the MFF test. (see Drake, 1970, Siegelman, 1969). The following is an example of E's modeled verbalizations on the PMA picture matching test:

> "I have to remember to go slowly to get it right. Look carefully at this one (the standard, now look at these carefully (the variants). Is this one different? Yes, it has an extra leaf. Good, I can eliminate this one. Now, let's look at this one (another variant). I think it's this one, but let me first check the others. Good, I'm going slow and carefully. O'kay, I think it's this one".

The impulsive child was exposed to a model who demonstrated the strategy to search for differences that would allow him successively to eliminate as incorrect all variants but one. The E modeled verbal statements or a strategy to make detailed comparisons across figures, looking at all variants before offering an answer. As in the first study E also modeled errors and then how to cope with errors and improve upon them. For example, following an error E would model the following verbalizations:

> "It's okay, just be careful. I should have looked more carefully. Follow the plan to check each one. Good, I'm going slowly".

After E modeled on an item S was given an opportunity to perform on a similar practice item. S was encouraged and socially reinforced for using the strategy E had just modeled, but did not receive explicit practice in self-instructing. This modeling alone group was designed to indicate the degree of behavioral change from exposure to an adult self-instructing model.

Cognitive Modeling Plus Self-instructional Training Group. The Ss in this group were exposed to the same modeling behavior by E as were the Ss in the modeling alone group, but in addition they were explicitly trained to produce the self-instructions E emitted while performing the task. After E modeled on an item, S was instructed to perform the task while talking aloud to himself as E had done. Over the course of the 8

practice trials the child's self-verbalizations were faded from initally an overt level to a covert level, as in Study I.

Attentional Control Groups. The Ss in this group observed the E perform the task and were given an opportunity to perform on each of the practice items. The E's verbalizations consisted only of general statements to "go slow, be careful, look carefully" but, did not include the explicit modeling of verbalizations dealing with scanning strategies as did the two treatment groups. The Ss were encouraged and socially reinforced to go slow and be careful, but were not trained to self-instruct. In many ways this group approximates the methods teachers and parents use to demonstrate a task in which they make general prohibitions, but do not explicate the strategies or details involved in solving the task. This group can be considered a minimal modeling condition or an attentional control group for exposure to E and practice on task materials.

Figure 5 indicates that prior to treatment the three groups performed comparably on initial performance and in response to the instructions to "go slower". An examination of the performance on Form III of the MFF following treatment indicates that on decision time, the two treatment groups significantly ($p < .05$) slowed down their decision time on Form III relative to their own prior performance on Forms I and II and relative to the control groups performance on Form III. The modeling plus self-instructional training groups who slowed down the most was significantly different ($t = 8.10$, $df = 8$, $p < .001$) from the modeling alone group on Form III. The analysis of the error scores indicated that only the Ss who recieved modeling plus self-instructional training significantly ($p < .05$) improve their performance relative to the other two groups and relative to their own prior performance. This latter result

of decreased errors is most significant in light of other investigators' (e.g., Debus, 1970; Kagan, Pearson & Welch, 1966) failure to significantly alter errors. In summary, the results indicate that the cognitive modeling plus self-instructional group was most effective in altering decision time and in reducing errors. The modeling alone group significantly decreased decision time, but did not significantly reduce errors. The efficacy of the self-instructional component of the training procedure in fostering behavioral change is underscored by the fact that three of the five Ss in the self-instruction group spontaneously verbalized on Form III of the MFF test; whereas none did so in the other two groups. Similarly in the pervious modification study, three Ss in the self-instructional groups spontaneously self-verbalized in the post-test and followup sessions.

In summary, the four studies indicate a strong relationship between the content of a child's private speech, his cognitive style, and his ability to control his own behavior. The cognitively impulsive children were found to use their private speech predominantly in an immature self-stimulating manner and to fail to alter the content of their private speech when the situation demanded it. In comparison to the cognitively reflective child, the impulsive child's private speech had less instrumental control over his motor behavior, had a less directive regulatory function, especially under covert self-instructional conditions. One way to engender self-control for impulsive children is by means of a cognitive self-guidance training procedure where impulsive children are taught explicitly to talk to themselves initially overtly and then covertly. The second modification study indicates that E's modeling of self-instructions is a necessary but not sufficient condition to facilitate behavioral change. The study indicates the importance of having the impulsive child

actively practice or behaviorally rehearse such self-instructions as well as being exposed to a self-instructing model.

The implications of the present research seems both widespread and evident. The possibility of using such a self-instructional procedure to train children to talk to themselves, or in other words to train children to think, implies that a variety of maladaptive behaviors, as well as a variety of cognitive styles are subject to change (see Meichenbaum (1971a) for fuller discussion of these implications). The possibility of using educational television such as Sesame Street to teach cognitive self-instructional styles also seems promising (Meichenbaum, 1971b). Such eductional television programs can explicitly model cognitive strategies and self-instructions, as well as desired behaviors. Future directions for the self-instruction training procedure involve: (a) group administration of self-instructional training; (b) application of self-instructional training to interpersonal behaviors where the child is explicitly taught to influence another person's behavior by means of his own instructions; and (c) more intensive self-instructional training for an individual by having the child work at teaching machines in which self-instructions are included in the program format.

In conclusion, it should be made clear that the present studies do not suggest that reflective children actively talk to themselves in order to control their behaviors. However, if one wishes to encourage an impulsive child to become reflective, then explicitly training him to talk to himself, initially overtly and eventually covertly, will enhance the change process. Within this conceptual framework an entire range of cognitive activities becomes trainable. What does one train a child to say to himself in order to be internally oriented (ala Rotter), to be altruistic, to be creative?

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Footnotes

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[2]The Matching Familiar Figures Test consisted of two practice and twelve test items. The items used were selected from both Michael Lewis preschool version of the MFF test and the easier items from Kagan's version of the MFF test.

[3]An overall soical participation or social maturity scored was obtained by combining the six subcategories of behavior in a weighted percentage score. Using Parten and Newhall's (1946) system the behaviors were weighted as follows: -3, unoccupied behavior; -2 solitary play; -1 onlooker behavior; +1 parallel play; +2 associative play; +3 cooperative play. A child's total score for social participation was derived by multiplying the percentage of episodes at each level by the weight for that level; for example, the total score for a given child might be (-3 x 0 percent) + (-2 x 10 percent) + (-1 x 20 percent) + (+1 x 20 percent) + (2 x 30 percent) + (3 x 20 percent) = 1.00. Thus, the social participation score ranges from -3 to +3.

TABLE 1 (Study 1)

COMPARISON OF REFLECTIVE (N=8) AND IMPULSIVE (N=8) NURSERY SCHOOL CHILDREN

		MFF Performance			
		Errors	Decision Time	Peabody IQ	Chronological Age (mos.)
Reflectives					
	$\bar{X}$	14.6	56.6	104.1	57.8
	sd	3.5	9.7	15.8	4.7
Impulsives					
	$\bar{X}$	25.0	24.1	100.6	54.0
	sd	3.9	6.9	19.5	5.2
t test		7.72	5.56	.39	1.53
sign. level two tail		$p < .001$	$p < .001$	ns	$p < .20$

TABLE 2 (Study 1)

COMPARISON OF REFLECTIVE AND IMPULSIVE CHILDREN'S SOCIAL PARTICIPATION SCORES IN FREE PLAY NURSERY SCHOOL ACTIVITIES

(Percentage scores are reported to indicate distribution of time spent in each activity)

Activity Categories	Reflectives X	Reflectives s.d.	Impulsives X	Impulsives s.d.	t	p
Unoccupied Behavior	6.4	6.1	8.1	7.3	.51	ns
Solitary Play	9.8	7.8	8.9	5.2	--	ns
Onlooker Behavior	9.6	6.9	13.8	12.1	.85	$p < .10$
Parallel Play	26.1	15.6	29.7	17.3	--	ns
Associative Play	35.0	16.6	33.3	24.5	--	ns
Cooperative Play	13.1	15.3	6.2	5.9	1.20	$p < .10$
Social Participation score[a]	+.87	.71	.59	.45	.77	$p < .10$

[a] Social Participation score or social maturity score is on overall weighted index which may vary from -3 to +3, see footnote 3.

TABLE 3 (Study 1)

PERCENTAGES OF EGOCENTRIC SPEECH IN FREE PLAY AND SPECIFIC TASKS ACTIVITIES FOR IMPULSIVE AND REFLECTIVE PRESCHOOLERS

	Developmental Levels of Private Speech		Free Play $\bar{X}$	Free Play s.d.	Specific Tasks $\bar{X}$	Specific Tasks s.d.	t	
I	Self-Stimulating Language (word play, noises, singing)	Reflectives	43.0	5.8	29.0	7.0	4.35	$p < .0005$
		Impulsives	64.0	6.4	70.0	9.5	1.48	$p < .10$
		t	6.88 $p < .0005$		9.28 $p < .0005$			
II	Outward directed Private Speech (e.g., remarks to nonhuman objects; describe own activity)	Reflectives	39.0	7.5	31.0	6.0	2.36	$p < .025$
		Impulsives	27.0	6.5	20.0	5.8	2.27	$p < .025$
		t	3.41 $p < .005$		3.72 $p < .005$			
III	Self-guiding Inward Directing Speech	Reflectives	11.0	4.5	25.0	10.5	3.46	$p < .005$
		Impulsives	6.5	5.0	5.0	4.5	.64	ns
		t	1.89 $p < .05$		4.95 $p < .0005$			
IV	External Manifestations of Inner Speech (inaudible mutterings)	Reflectives	7.0	4.0	15.0	7.0	2.81	$p < .01$
		Impulsives	2.5	2.0	5.0	4.5	1.43	$p < .10$
		t	2.85 $p < .01$		3.40 $p < .005$			

Figures

Figure 1. Percentage of verbalizations in various subcategories of speech for cognitively impulsive and reflective preschoolers. (Study I)

Figure 2 Percentage of the content of egocentric speech in free play and specific task nursery school activities. (Study I)

Figure 3 Comparison of the mean total number of foot depressions to the "don't push" light for impulsive and reflectives under overt and covert self-instructional conditions. (Study II)

Figure 4 Mean change scores from pre-treatment to post-treatment on performance measures (groups not connected by solid line are significantly different at .05 level). (Study III)

Figure 5. MFF performances of impulsive Ss who were in modeling alone group, modeling plus self-instructional training group, and attentional control group. (Study IV)

FIGURE 1

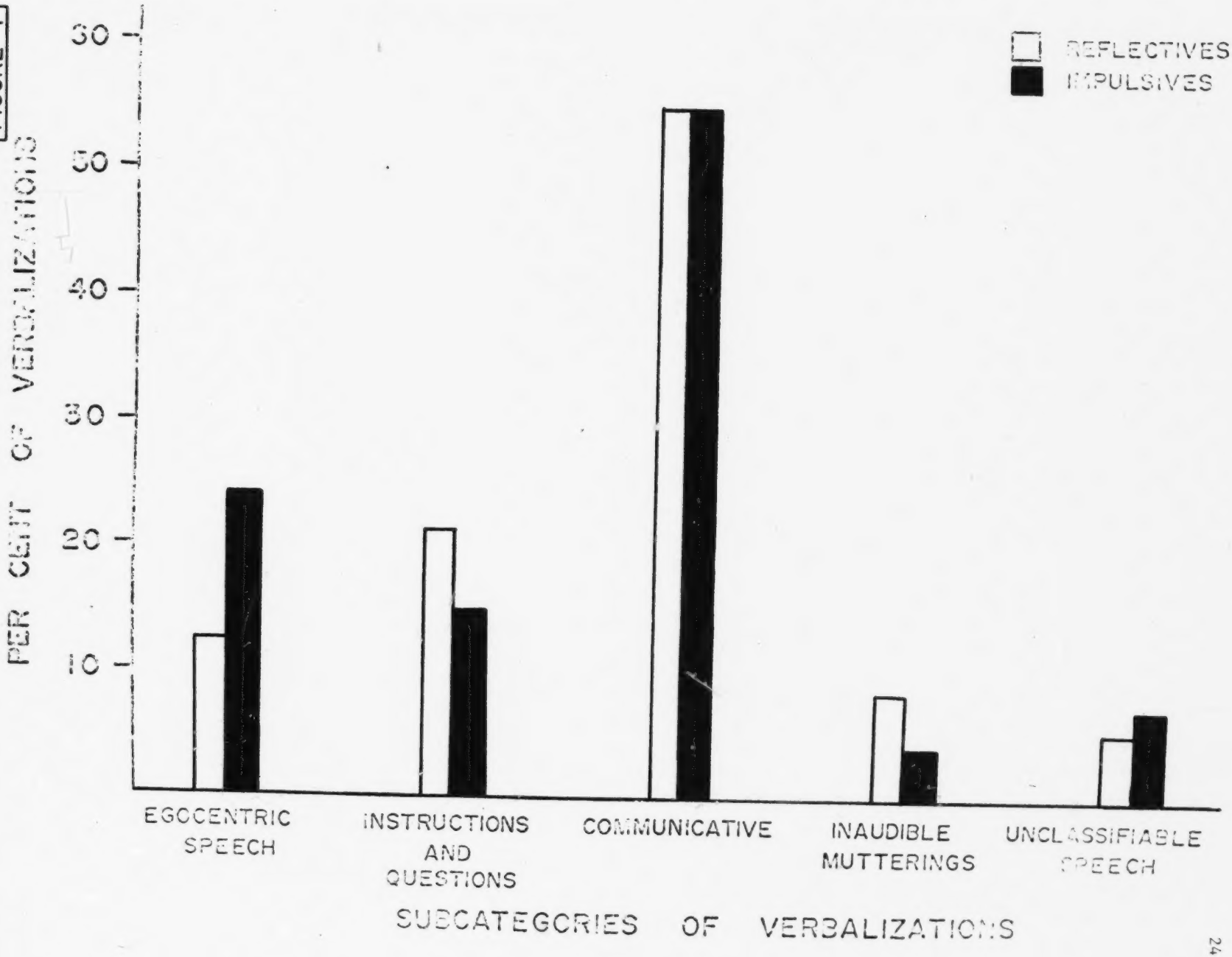

REFLECTIVES
IMPULSIVES
PER CENT OF VERBALIZATIONS
10
20
30
40
50
EGOCENTRIC SPEECH
INSTRUCTIONS AND QUESTIONS
COMMUNICATIVE
INAUDIBLE MUTTERINGS
UNCLASSIFIABLE SPEECH
SUBCATEGORIES OF VERBALIZATIONS

FIGURE 2

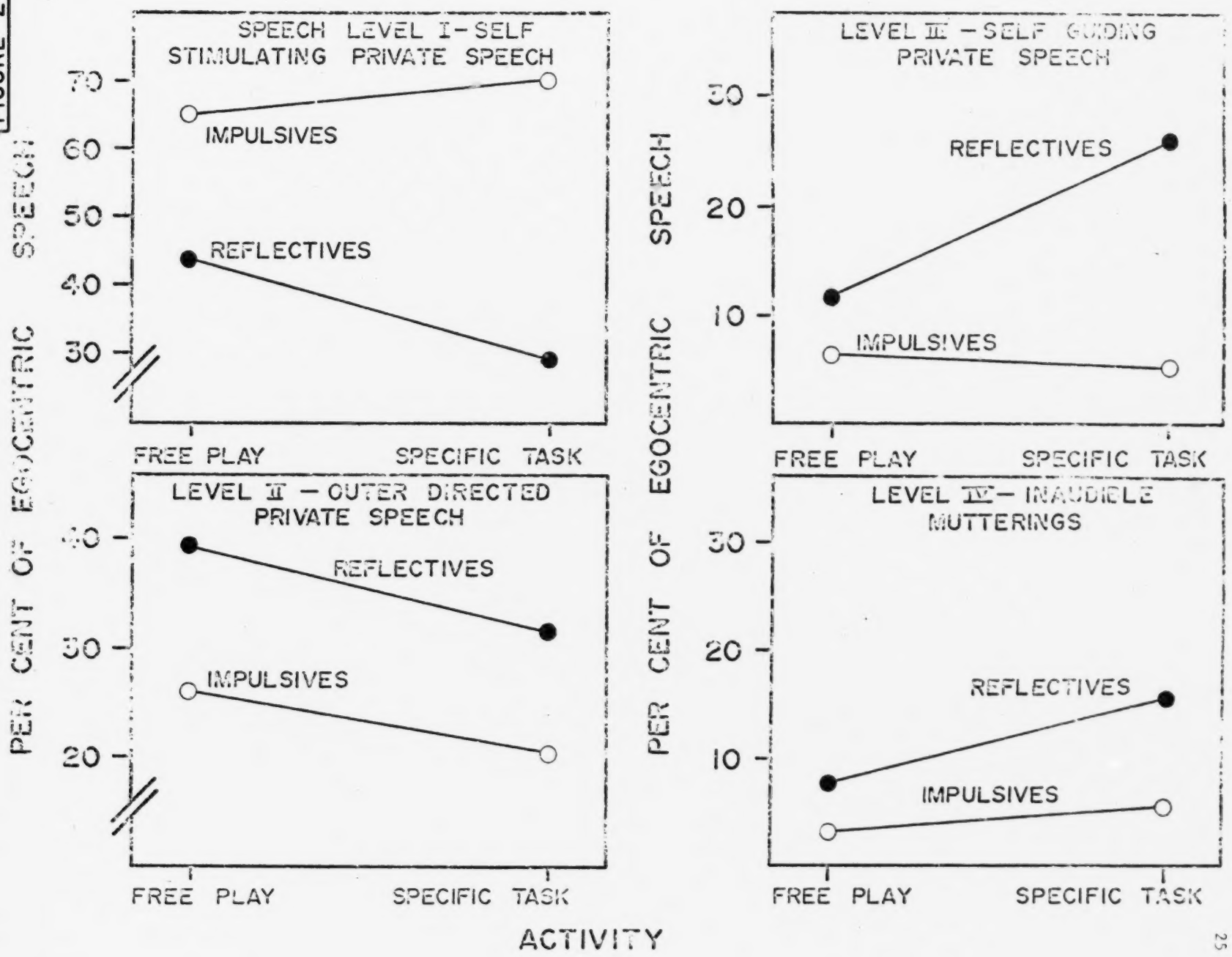
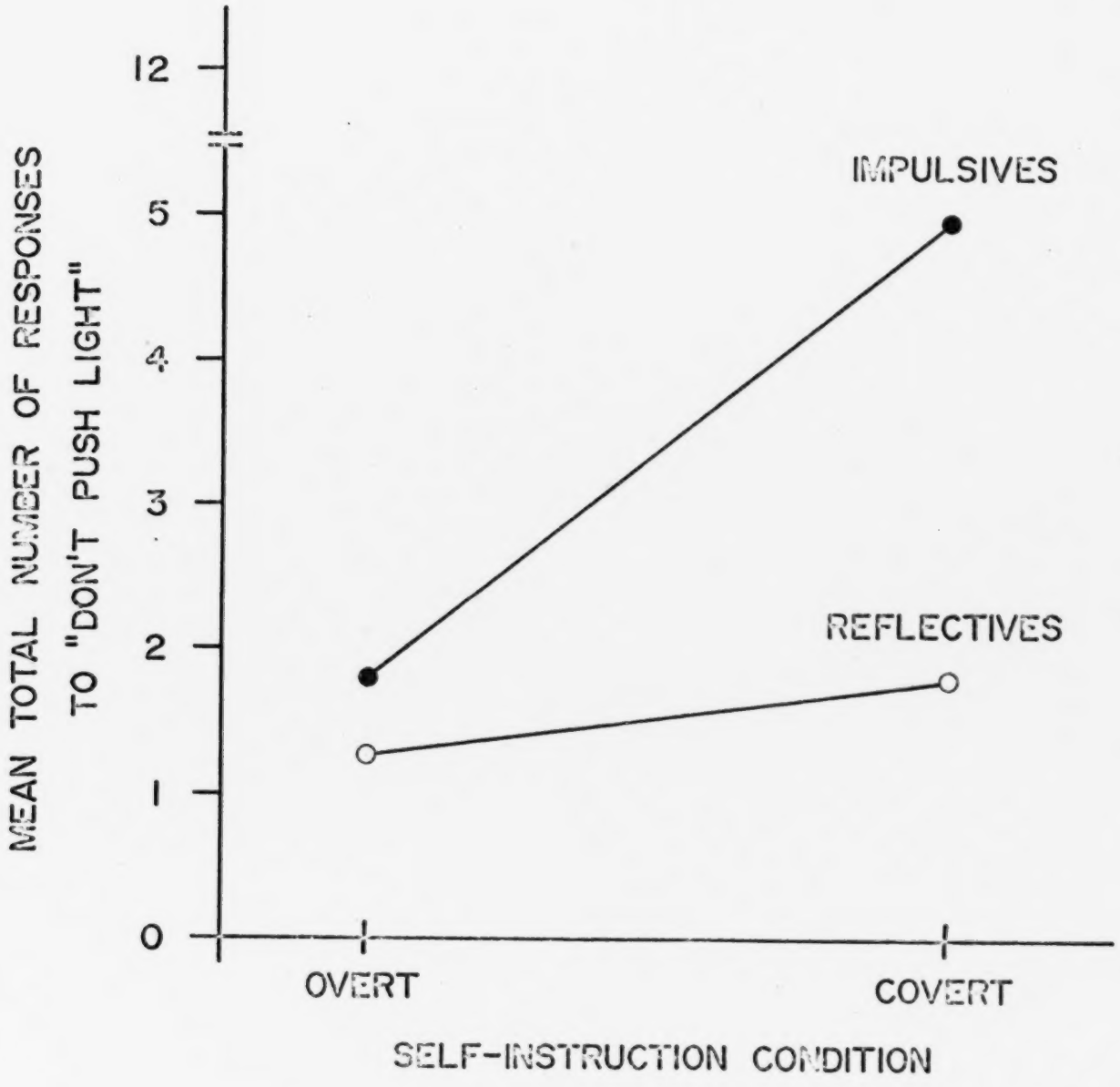

SPEECH LEVEL I – SELF STIMULATING PRIVATE SPEECH
IMPULSIVES
REFLECTIVES
FREE PLAY
SPECIFIC TASK
LEVEL III – SELF GUIDING PRIVATE SPEECH
REFLECTIVES
IMPULSIVES
FREE PLAY
SPECIFIC TASK
LEVEL II – OUTER DIRECTED PRIVATE SPEECH
REFLECTIVES
IMPULSIVES
FREE PLAY
SPECIFIC TASK
LEVEL IV – INAUDIBLE MUTTERINGS
REFLECTIVES
IMPULSIVES
FREE PLAY
SPECIFIC TASK
PER CENT OF EGOCENTRIC SPEECH
ACTIVITY

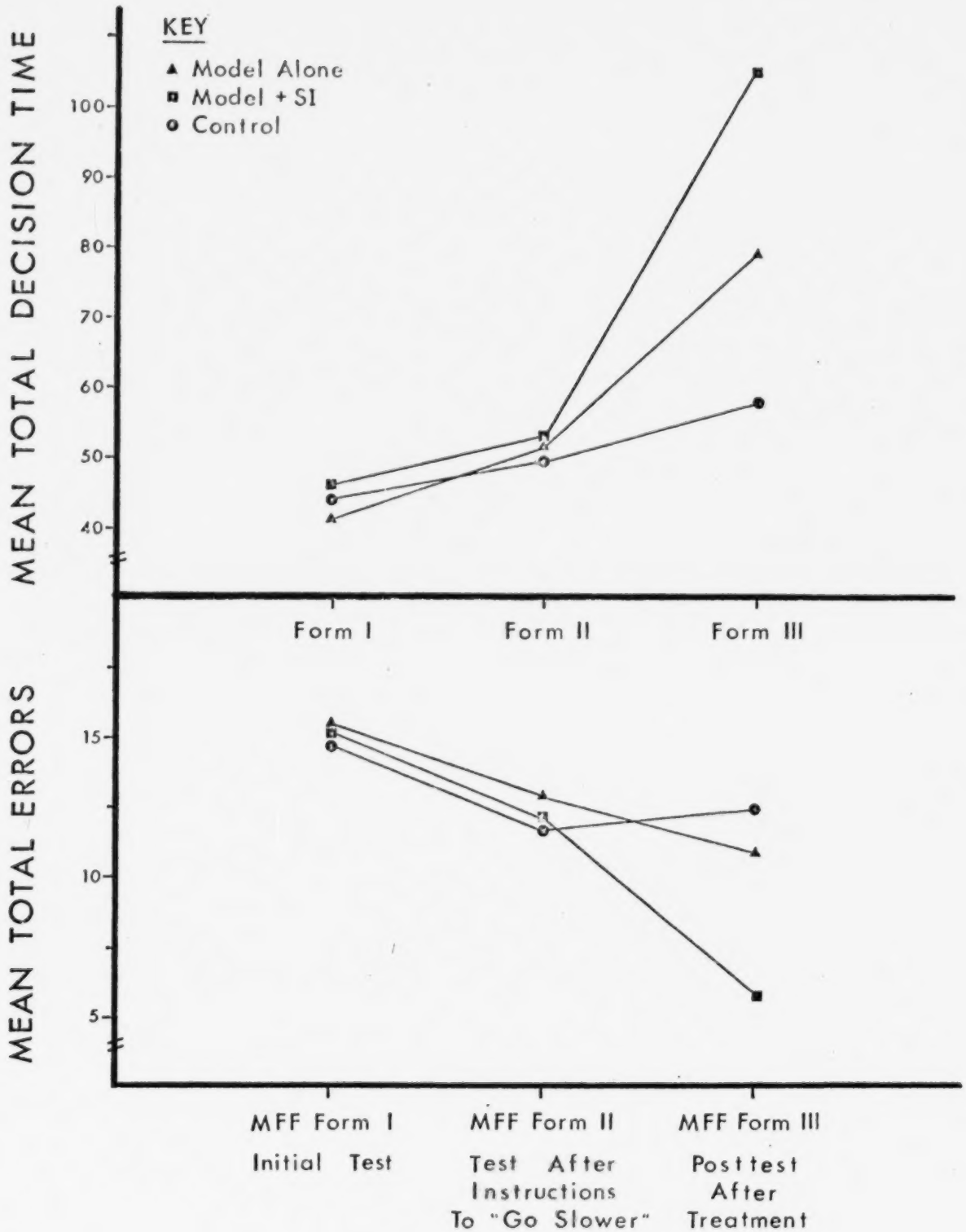
FIGURE 3


MEAN TOTAL NUMBER OF RESPONSES TO "DON'T PUSH LIGHT"
12
5
4
3
2
1
0
IMPULSIVES
REFLECTIVES
OVERT
COVERT
SELF-INSTRUCTION CONDITION

MEAN PRE-POST
INCREASE
IMPROVED SCORES
ON POSTTEST
WISC
PRORATED
IQ
PICTURE
ARRANGEMENT
CODING
SUBTEST
SCALED SCORES
SCALED SCORES
MFF LATENCY
SCORE
SECONDS
MFF
ERRORS
PORTEUS
MAZE ERRORS
MEAN PRE-POST
REDUCTION
FEWER ERRORS
ON POSTTEST
FEWER ERRORS
ON POSTTEST
COGNITIVE TRAINING
ATTENTION CONTROL
ASSESSMENT CONTROL

FIGURE 4

FIGURE 5


KEY
Model Alone
Model + SI
Control
MEAN TOTAL DECISION TIME
100
90
80
70
60
50
40
Form I
Form II
Form III
MEAN TOTAL ERRORS
15
10
5
MFF Form I
Initial Test
MFF Form II
Test After Instructions To "Go Slower"
MFF Form III
Posttest After Treatment